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November 2010

LAND'S END?
THE FUTURE(S) OF PROTECTED AREAS

ESSAYS BY EDDIE GAME, NIGEL DUDLEY, SILVIA BENITEZ & ROB McDONALD

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Apocalypse Forestalled: Why All the World's Fisheries Aren't Collapsing

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Editor's Note

A phrase in the air at the Conservancy's Worldwide Office these days is "the shiny object" — meaning, the new hot thing in our work. Water funds are still a shiny object; so is adaptation, urban conservation, direct response TV and the iPad. Protected areas, on the other hand, are as lacking in shine, as in need of a good polishing scrub, as a concept could get. They seem like the old heirloom parlor sofa — uncomfortable, in the way, doesn't go with anything else, but just too heavy and too...*already there* to discard.

So when I approached Eddie Game to help me put together a suite of pieces for *Chronicles* on whether protected areas have a future in conservation, I expected to be editing a series of eulogies. That the pieces are anything but suggests both my own ignorance as well as conservation's chafing at the defining success of what Eddie calls our "one big idea." Incorporating protected areas into new uses perhaps reflects our own difficulties in folding the success and emotional resonance of TNC's old tag phrase "Saving the Last Great Places" into a new identity that encompasses all that we are...whatever that might be. These pieces point some ways forward.

This issue also introduces two new features. **The Lead** is a deliberately provocative kick-off essay designed to stir debate. (Ray Hilborn does a great job with the first installment; we hope to build a panel discussion on the topic this spring at WO.) And **New Conservancy Research** features TNC scientists (this month, Joe Fargione) on their new or forthcoming research.

Alert: The December issue marks **the return of the Holiday Book Issue**, which I am throwing open to your review contributions. These are short reviews — no more than 150 words — of any 2010 book you've liked, fiction or non-fiction, nature-based or otherwise. (Zombies are popular this year.) **Deadline is 29 November**; email me before with the titles you're reviewing.

Finally, I apologize to Rebecca Shaw for mistyping her title in last month's issue: She is the associate (not the "associated") director of conservation and science for The Nature Conservancy in California. In rushing to get *Chronicles* out, I've allowed typos to creep in. That's almost inevitable for a pub this size run by one person, but it's still unacceptable, and I'll do better.

—Bob Lalasz
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Letters

To the Editor:

It seems to me that one of the key issues regarding EBA is the way we define (and market) the importance of biological diversity and of individual species. Patrick McCarthy spelled it out nicely in his article *(Science Chronicles*, October 2010). It's not a new issue. The science community has wrestled with that for a very long time, and it is also a major part of the discussion about whether or not ecological services is a good way to market conservation work. In the latter case, one worry is that if we place values on species and natural systems based on their value to human society, we paint ourselves into a corner when it comes to species/communities that have no easily measurable value.

I don't work with Karner Blue butterflies, but that's a species TNC spends a lot of resources trying to conserve. I've never heard us try to sell Karner Blue conservation based on their value to society. Could we? If not, we're committing ourselves to protecting that species for its own sake, and putting a lot of resources into that. I think that's fine. I'm all in favor of including the benefits of conservation to people in our conservation planning, but only if we don't abandon conservation for the sake of the biological diversity itself. That doesn't mean that we have to fight hopeless battles to conserve every species, but it does color the approach to our conservation work, and I think it's important to clearly define our stance and approach.

—**Chris Helzer**, program director, The Nature Conservancy/Eastern Nebraska Program Office

To the Editor:

Very interesting issue (*Science Chronicles*, October 2010). As the new coordinator of the Long Island invasives management area, I wondered what this issue would look like if we substituted "invasives" for every time it mentioned "climate change." In my opinion, invasives are a much more immediate threat to biodiversity and to nature's benefits that are provided to humans, especially on a local scale. What would EBA look like if applied to invasives? How could we use nature to control invasives instead of using herbicides and mechanical control (analogous to seawalls?). If we're going to work around people more, then invasive species are going to have to be addressed by TNC in an effort that is equal to or greater than climate change.

—**Steve Young**, chief botanist, New York Natural Heritage Program and coordinator, Long Island Invasive Species Management Area

The Lead

Apocalypse Forestalled: Why All the World's Fisheries Aren't Collapsing

By Ray Hilborn
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If you have paid any attention to the conservation literature or science journalism over the last five years, you likely have gotten the impression that our oceans are so poorly managed that they soon will be empty of fish — unless governments order drastic curtailment of current fishing practices, including the establishment of huge no-take zones across great swaths of the oceans.

To be fair, there are some places where such severe declines may be true. A more balanced diagnosis, however, tells a different story — one that still requires changes in some fishing practices, but that is far from alarmist. But this balanced diagnosis is being almost wholly ignored in favor of an apocalyptic rhetoric that obscures the true issues fisheries face as well as the correct cures for those problems.

To get the storyline correct, it is important to go back to the sources of the apocalyptic rhetoric. In 2006, a paper was published by Boris Worm in *Science* (Worm et al. 2006) that received enormous press coverage. It argued that, if current trends continued, all fish stocks would collapse by 2048. Worm and his coauthors concluded their paper with the following sentence: "Our analyses suggest that business as usual would foreshadow serious threats to global food security, coastal water quality, and ecosystem stability, affecting current and future generations."

> Generally, fishing pressure has been reduced enough that all but 17 percent of stocks would be expected to recover to above overfished thresholds if current fishing pressure continues.

Others joined in, chief among them Daniel Pauly, who rang and continues to ring the apocalyptic note. "There are basically two alternatives for fisheries science and management: one is obviously continuing with business as usual…," wrote Pauly in 2009 (Pauly 2009a). "This would lead, in addition to further depletion of biodiversity, to intensification of 'fishing down marine food webs,' which ultimately involves the transformation of marine ecosystems into dead zones."

It might surprise you to learn Pauly's views are not universally held among scientists. Indeed, these papers exposed a deep divide in the marine science community over the state of fish stocks and the success of existing fisheries management approaches. Numerous critiques of the apocalyptic stance were published after the 2006 paper, suggesting that Worm et al. had greatly exaggerated the failings of "business as usual." For instance, Steve Murawski, director of scientific programs and chief science advisor, defended the U.S. fisheries management system and pointed out that the proportion of stocks overfished in the U.S. was declining, not increasing (Murawski et al. 2007).

No one disagrees on our goals for the world's fisheries stocks — we need higher fish abundances. The arguments are largely about where we are now and how we will get to higher fish abundance and lower fishing pressure. Are current fisheries management systems working to decimate fish stocks…or rebuild them? Do we need large areas of the oceans closed to fishing to assure sustainable seafood supply? Daniel Pauly says yes to the latter question: "This transformation," he writes, "would also require extensive use of ocean zoning and spatial closures, including no-take marine protected areas (MPAs). Indeed, MPAs must be at the core of any scheme intending to put fisheries on an ecologically sustainable basis" (Pauly 2009a).

In an attempt to resolve this dispute, Boris Worm and I several years ago organized a set of four meetings, sponsored by the National Center for Ecological Analysis and Synthesis (NCEAS), in which we assembled a database on abundance as measured by fisheries agencies and research surveys. Participants included several of the authors of the

2006 paper as well as several people from national fisheries management agencies.

The results were published in *Science* in 2009 (Worm et al. 2009), and showed that, while the majority of stocks were still below target levels, fishing pressure had been reduced in most ecosystems (for which we had data) to below the point that would assure long-term maximum sustainable yield of fish from those ecosystems. About 30 percent of the stocks would currently be classified as overfished — but, generally, fishing pressure has been reduced enough that all but 17 percent of stocks would be expected to recover to above overfished thresholds if current fishing pressure continues. In the United States, there was clear evidence for the rebuilding of marine ecosystems and stock biomass. The idea that 70 percent of the world's fish stocks are overfished or collapsed and that the rate of overfishing is accelerating (Pauly 2007) was shown by Worm et al. (2009) and FAO (2009) to be untrue.

The *Science* paper coming out of the NCEAS group also showed that the success in reducing fishing pressure had been achieved by a broad range of traditional fisheries management tools — including catch-and-effort limitation, gear restrictions and temporary closed areas. Marine protected areas were an insignificant factor in the success achieved.

The database generated by the NCEAS group and subsequent analysis has shown that many of the assumptions fueling the standard apocalyptic scenarios painted by the gloom-and-doom proponents are untrue:

- For instance, the widespread notion that fishermen generally sequentially deplete food webs (Pauly et al. 1998) — starting with the predators and working their way down — is simply not supported by data.
- Declining trophic level of fishery landings is just as often a result of new fisheries developing rather than old ones collapsing (Essington et al. 2006).
- Catch data also show that fishing patterns are driven by economics, with trophic level a poor predictor of exploitation history (Sethi et al. 2010).
- Furthermore, the mean trophic level of marine ecosystems is unrelated to (or even negatively correlated with) the trophic level of fishery landings (Branch et al. 2010).
- And the oft-cited assessment that the large fish of the oceans were collapsed by 1980 (Myers and Worm 2003) is totally inconsistent with the database we have assembled — for instance, world tuna stocks in total are at present well above the level that would produce maximum sustained yield, except bluefin tuna and some other billfish that are depleted (Hutchings 2010).

Nevertheless, many in the marine conservation community appear unwilling to accept these results, continue to insist that all fish may be gone by 2048, and use declining catches in fisheries where regulations have reduced catches as indications of stock collapse.

No one argues that all fisheries are well-managed, and so far we do not have abundance estimates for many parts of the

world, especially Asia and Africa. Using the catch-based methods of Worm et al. (2006) and Pauly, these areas appear to have fewer stock collapses and overfished stocks than in the areas for which we have abundance data. However, we do not know if these areas have been reducing exploitation rates or if they are still increasing.

The evidence is strong that we can and are rebuilding stocks in many places. Let us accept that progress and identify the problem stocks and how to fix them.

Finally, in places without strong central government control of fishing, there is broad agreement that community-based co-management can be effective. For these fisheries, management tools are very different than those used for industrial fishery stocks, and MPAs are here often a key ingredient. The lessons from the Worm et al. (2009) paper about what works to rebuild fish stocks are applicable to industrial fisheries, but probably not to the small-scale fisheries that support many fishing communities.

There is considerable room for policy debate about where we want to be in the tradeoff between yield and environmental impact of fishing. There is no denying that sustainable fishing changes ecosystems, and that different societies will almost certainly make different choices about how much environmental change they will accept in return for sustainable food production. But science cannot provide the answers for this debate; it can only evaluate the tradeoffs.

My perspective is that we need to treat fisheries like medical diagnoses. We must identify which fisheries are in trouble and find the cures for those individual fisheries. The evidence is strong that we can and are rebuilding stocks in many places. Let us accept that progress and identify the problem stocks and how to fix them.

Apocalyptic assertions that fisheries management is failing are counterproductive — not only because these assertions are untrue, but because they fail to recognize the long, hard work of fishery managers, scientists and stakeholders in the many places where management *is* working. While the gloom-and-doom advocates have been attracting public attention and press coverage, thousands of people — decried by Pauly (2009b) as agents of the commercial fishing interests — have worked through years of meetings and painful catch and effort reductions to lower fishing pressure and successfully rebuild fisheries. **SC**

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Land's End? The Future(s) of Protected Areas

How to Renew Conservation's One Big Idea

By Eddie Game
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Protected areas are by a mile the singularly most identifiable product of the conservation movement. They are our one "big idea." In some form or another, they exist in nearly every country on the planet.

According to the World Database on Protected Areas, all 192 UN member states have at least one protected area, and so do another 27 overseas territories or semi-autonomous regions. There is probably not a corporation in the world that can claim that kind of coverage.

But in many conservation circles, protected areas seem to be falling out of favour. They have failed to prevent an accelerating loss of global biodiversity. They are seen as a paternalistic, colonial idea — one neither morally justifiable while people live in poverty nor up to the large-scale challenges facing today's environment and biodiversity. Hectare by hectare, they are almost certainly not the most efficient approach to biodiversity conservation — but they might just be the most efficient approach to conservation, period. And there's the rub: Conservation has been spectacularly unsuccessful at selling the idea of biodiversity.

For 30 years, we've being trying to get people to believe in biodiversity — and it has never been as successful as the appeal of national parks (the quintessential protected area). When the conservation movement embraced "biodiversity," scientists tuned in… and the public tuned out. Rather than provide a clear and inspiring mandate for protected areas, we made the reason for their establishment more prosaic and impenetrable.

Focusing on "nature's benefits" makes nature about too few a people. It appeals to self-interest, when instead a bigger-than-self community spirit is needed.

Now we're turning back to the people. Conservation to deliver the things YOU care about. Be it clean water, pollination, food security, or storm shelter — conservation can provide it. This is conservation as a capitalist liberal democracy, in which the rights of an individual are supreme to those of the State: In order to be sustained, conservation efforts must always come out positive in any individual cost-benefit assessment.

Far from being eternally marginalised in this brave new world, protected areas are being cleverly repositioned as the natural mechanism to deliver on conservation's new promise — "nature's benefits" (the other contributions to this "Land's End" section of *Science Chronicles* provide evidence of this). And so they should; for every failed protected area, there are probably two success stories. In general, protected areas have demonstrated remarkable legislative durability (although some have argued this durability is not necessarily positive for conservation, as it entrenches inefficiencies).

Even in anthropocentric conservation projects in which livelihoods are front and centre and biodiversity is something of a dirty word — when it comes to actual strategies on the ground, more often than not, some form of protected area is involved. This is partly because protected areas are what conservation knows and has expertise in (and we shouldn't pretend otherwise); but it's also partly because hard evidence to support more production-friendly conservation strategies is so far limited. (Thoroughly testing the utility of non-protected area strategies should be a priority for conservation.)

I've often heard it said that conservation, and protected areas in particular, have been too much about nature and not enough about people. This is undoubtedly true. However, counter to the opinion of many people I respect, I would argue that focusing on "nature's benefits" actually stops short on this account — it makes nature about too few a people. It appeals to self-interest, when instead a bigger-than-self community spirit is needed. And it is here where protected areas might be putting short-term strategic gains over long-term success.

Probably the most interesting report I've read this year is called *Common Cause: The Case for Working with our Cultural Values*.

Written by Tom Crompton of WWF-UK (a person with the wonderful title of "Change Strategist"), the report pulls together an impressive body of empirical evidence and recent research in psychology and cognitive sciences. Crompton's thesis is essentially that tackling issues through appeals to individual interests — even when successful — serves to reinforce the perceived importance of these interests, simultaneously diminishing and undermining the value basis of concern about bigger-than-self issues.

The report argues that, far from being at the mercy of an immovable set of cultural values, environmental and humanitarian groups can influence the deep values of society through consistent and transparent messaging. And it is precisely these bigger-than-self values that "must be championed if we are to uncover the collective will to deal with today's profound global challenges," argues Crompton.

Protected areas are case in point. Realised as national parks, they are a fantastically egalitarian idea — more Paris Commune than American capitalism (ironic, given the U.S. origin of the modern protected-area idea). As Nigel Dudley so eloquently puts it in his contribution here, protected areas are "at their best a demonstration of the finest in human society."

So we need to recapture for protected areas the mantle as guardians of our shared natural heritage, for both present and future generations; a stewardship whose justification falls neither on biodiversity nor on personal interest. If that sounds like the ranting of a Western pinko environmentalist — you'd be right. But I'm also fortunate enough to know first-hand that the notion of preserving natural heritage for current and future generations has resonance in the least developed places on the planet in a way that the idea of "biodiversity" never did.

But this argument does not mean that we shouldn't continue to focus on protected areas in places and ways that deliver benefits to human communities in the vicinity. Nor does it mean that we shouldn't talk about "nature's benefits." It simply means we need to be clear about our values and consistent with our messaging.

To borrow an example from Crompton's report, one approach would be to subsume the economic argument within a wider moral imperative. Conservation could consistently emphasize the need to protect natural heritage for this and future generations — while also presenting clear evidence of the benefits that protected areas deliver for communities as a response to those concerned about the social consequences of that protection. This "heritage and benefits" message is no less about people than would be an appeal to self-interest; it's just more consistent in its values.

Let's hope for our children's sake that, in our excessive zeal to make conservation a form a self-interest, we do not also make protected areas unfashionable. **SC**

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Land's End? The Future(s) of Protected Areas

Catch-22: Protected Areas and the Future of Life on Earth

By Nigel Dudley
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Protected areas don't work — but they're the only thing that does work. Anyone with more than a casual interest in conservation could be forgiven for getting confused.

Protected areas don't work because, while they are the main tool used to protect biodiversity, biodiversity remains in crisis, with extinction rates accelerating. Species are disappearing even inside protected areas. Furthermore, well-publicised cases tell of human communities being dispossessed of land and rights to create protected areas. Critics, including some conservationists, question the whole approach and suggest instead "mainstreaming conservation" within the wider landscape.

But protected areas are the only thing that does work because, of all the environmental targets set by the Millennium Development Goals and the Convention on Biological Diversity, creation and management of protected areas stand out as atypically successful; not perfect, but a beacon of light in a depressing picture of loss. Plans for "mainstreaming" conservation remain vague and often themselves reliant on the survival of natural ecosystems to provide reservoirs of biodiversity. How to reconcile these perspectives?

Creation and management of protected areas stand out as atypically successful; not perfect, but a beacon of light in a depressing picture of loss.

To begin with, protected areas only work well if they are planned and managed well. Setting up a protected area without adequate management capacity, trained staff or equipment is a recipe for failure. Protected areas worldwide provide billions of dollars worth of ecosystem services — not to mention their biodiversity values — yet governments often invest minimal amounts in their management.

One critical element of good management is gaining public support; a park surrounded by resentful, angry people will be forever at risk. In many places, this support depends on more than just enthusiasm for nature: protected areas must show multiple benefits. Fortunately, most do. They give potable drinking water, healthy fish stocks, crop-breeding material, pharmaceuticals, protection from natural disasters and (recently noticed) vast carbon stores. They provide places to regain mental and physical health, iconic cultural treasures and sacred sites for many faith groups.

Many of these goods and services remain largely hidden, even from the people who are gaining most directly. One-third of the world's 100 largest cities receive much of their drinking water from forest protected areas, which ensure exceptionally pure supplies. Plant-based pharmaceuticals are the basis for a multi-billion-dollar-a-year industry, which is increasingly looking towards protected areas as sources of genetic material.

The Millennium Ecosystem Assessment estimates that 60 percent of global ecosystem services are degraded. This degradation, the report says, has "…contributed to a significant rise in the number of floods and major wildfires on all continents since the 1940s." Natural vegetation in protected areas buffers communities against tidal surges, flooding and landslides — and these benefits are gradually becoming recognised and, through initiatives such as The Economics of Ecosystems and Biodiversity (TEEB), their economic values calculated. Attitudes toward people within protected areas have also undergone a massive shift, and today many "wilderness areas" provide secure homes for otherwise threatened indigenous communities — one reason why Australian aboriginals volunteered 20 million hectares of Indigenous Protected Areas in recent years.

To be successful, protected areas also need to be integrated into wider conservation strategies. Physically isolated parks fail as often as those that are socially or politically isolated. Good protected areas function as a system rather than a series of isolated sites, buffered and interconnected by sympathetic management such as sustainable agriculture and forestry. Creating a protected area is not carte blanche for wrecking what remains outside. But neither can parks easily be replaced. While some biodiversity can be protected in plantations, farmland and urban edges, other species — and we are learning that it is often a large proportion — require natural ecosystems to survive. Recent work on links between biological complexity and resilience to climate change has increased the number of reasons for setting aside ecosystems to function as naturally as possible.

Protected areas [are] the single most essential piece of the conservation jigsaw: often infuriating and often flawed, but at their best of demonstration of the finest in human society as well as the finest ecosystems.

After years of working on sustainable-use issues, I switched to a focus on protected areas because I came to see them as the single most essential piece of the conservation jigsaw: often infuriating and often flawed, but at their best a demonstration of the finest in human society as well as the finest ecosystems. Given the likelihood of massive climate change and the multiple other pressures facing us, it seems certain that we will continue to lose species in the coming years. A well-functioning protected-area system is our best chance of minimising these losses. As the Convention on Biological Diversity has just launched its renewed Programme of Work on Protected Areas, it is vital that those concerned about conservation throw their weight behind this ambitious and essential target. **SC**

Nigel Dudley is a consultant and member of the World Commission on Protected Areas. He is co-editor (with Sue Stolton) of the book Arguments for Protected Areas, bringing together a decade's worth of research, and lead author of Natural Solutions, a report on protected areas as tools against climate change. He co-authored chapters on protected areas in two of the TEEB reports.

Image: A protected area for nesting birds at the west end of Dauphin Island, Alabama. Image credit: Catherine J. Hibbard/USFWS, via a Creative Commons license.

Land's End? The Future(s) of Protected Areas

Why Protected Areas are Still Innovative

By Silvia Benitez
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When I started working with The Nature Conservancy nine years ago, we were a key organization in terms of protected areas conservation in Latin America. We took a landscape approach, working toward a representative and resilient system of protected areas on the continent that also incorporated the notion of living boundaries for those areas — accommodating the sustainable-use needs of people as well as nature. Under this approach, protected areas were about (a) integrating different land uses and the humans living around or within these areas, and (b) integrating science with policy to show the benefits protected areas can provide to human societies.

It's not an exaggeration to say that that approach has paid off handsomely. One important example of how protected areas have been critical to conservation in Latin America was a high-leverage strategy known as the National Implementation Support Partnership agreements

(NISP). During COP-7 in 2001, the Conservancy (along with other organizations) supported NISP, a multinational memorandum of understanding to collaborate toward the implementation of a Program of Work on Protected Areas.

That description sounds dry — but the MOU has catalyzed protected areas work on the continent. In Ecuador, for example, the MOU spurred several organizations to support the national government's assessment of gaps in its current protected areas system and the development of a plan to fill those gaps. The results of this collaboration were impressive: Not only was the gap assessment adopted by Ecuador's Ministry of the Environment, it's been included as one of the national objectives in the Ecuador National Development Plan. The plan helped identify and create two marine protected areas as well as important sub-national terrestrial protected areas and conservation investments. NISP agreements have also been successful in Perú, Panamá and Costa Rica.

We are still harvesting conservation results with the seed we planted through the NISP agreements — and they're not the only example of Conservancy success with protected areas. Water funds — now a major Conservancy strategy — were born as a financial mechanism to support the sustainability of protected areas providing water to Quito. While water funds won't be able to guarantee sustainability for all the areas we care about, several water funds are now supporting protected areas across the Andean region.

Conservation in Latin America will rely on protected areas for the foreseeable future. They cover more than 450 million hectares on the continent and are critical for maintaining biodiversity, for providing water to cities and towns, and as watersheds that provide energy to several countries. Protected areas are also important throughout the continent for maintaining fisheries, and in face of climate change they hold some of the largest patches of natural ecosystems. Indeed, we must build our ecosystem-based adaptation strategies in Latin America within and around P.A.s — they offer us the highest feasibility for success.

But despite the success and centrality of protected areas, the current work of the Conservancy in Latin America seems to be moving away from them. Protected areas are no longer a priority strategy for the region, and only a few of our conservation programs in Latin America have them as a core part of their work. We should be careful as an organization that, as we look for innovative ways of doing conservation, we don't leave behind work that may not sound as innovative but has been the basis for many effective new initiatives. If the Conservancy continues to turn away from protected areas conservation, we will lose a high-impact and high-return approach through which we can influence policy with good science and bring important benefits to human societies. Latin America shows just how effective and relevant protected areas still are. **SC**

Image: Small river flowing through the paramos landscape, Ecuador. Image credit: Bridget Besaw.

Land's End? The Future(s) of Protected Areas

Not the Beginning of the End, But the End of the Beginning

By Rob McDonald
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There's been lots of talk recently about the limitations of protected areas, and some of that theme is captured in the other "Land's' End?" essays. Really, the debate is about how best to expand the concept of a protected area to account for the changed realities of the 21st century. Climate change may threaten the biodiversity of virtually every protected area on Earth, rendering decades of conservation investment moot. And of course the reality of climate change will require a new way of planning for protected areas that aims to create a resilient network of parks. More broadly, there is an increased focus on the role protected areas play in protecting and enhancing the benefits nature provides to people, particularly the world's poorest and most needy. This focus, too, will require changes in how we think about the idea of a "protected area."

I support this expanded conception of a protected area, and want to be part of that debate. However, I sometimes think all this talk is a bit overblown. Every generation of conservation biologists and planners has changed how they think about protected areas and what they

are good for — why should ours be any different? More importantly, it's crucial that conservationists tell the world that we aren't backing away from the protected-area strategy one inch. Protected areas are arguably the greatest success of the environmental and conservation movement. (What else is there? The Endangered Species Act? The Clean Water and Clean Air Acts? The concept of an environmental impact statement?). It's hard to think of anything else we've done that's protected nearly as much wildlife. Creating protected areas remains The Conservancy's core business, and it is one of the few things I feel confident claiming we do better than almost any other NGO. We cannot abandon our core business simply because it won't get us everything we want, but we can certainly expand into a few more sectors that we must master to fulfill our mission.

It's crucial that conservationists tell the world that we aren't backing away from the protected-area strategy one inch.

My colleague Tim Boucher and I recently tried to analyze global trends in protected area creation in order to answer a simple question: How much more land could be plausibly protected by 2030? The short answer is: "a lot." Potentially as much land could be protected worldwide in the next two decades as was protected in the last two. There are still many countries that are below the average rate of protection for the international community. One of The Conservancy's key roles is to help shame these countries into joining the international consensus on protected areas. As many of these countries are poor or political unstable, this requires a different set of approaches than The Conservancy has pursued in its home base, the United States.

However, our research also shows that there are diminishing returns to efforts to create protected areas. As the amount of land previously protected in a country increases, the rate of new protection tends to slow down. The protection that does occur tends to be more multiple-use protected areas, rather than strictly protected parks. The Conservancy's overall message thus has to be that creating a protected area network is the necessary beginning of a country's journey to sustainability, not its endpoint. We have to make clear that we are committed to help countries start on that journey, but also that we have an array of conservation strategies ready that help complete the journey, by making land use on the rest of the landscape more sustainable. **SC**

Image: Field of Owl's Clover flowers at the Parker Ranch, California. Image credit: Ian Shive.

***Have a response to any of these "Land's End?" pieces? Send it to rlalasz@tnc.org for inclusion in an upcoming* Chronicles.**

Articles

How Are We Measuring Up? Where We've Been and Need to Go with Measures at the Conservancy

By Craig Groves
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Measures continue to be a struggle for much of conservation. A 2010 survey of major conservation organizations (including the Conservancy) and funders of these organizations conducted by the Conservation Measures Partnership[1] revealed that, for every conservation dollar spent, only 10-30 cents worth is guided by some type of performance or effectiveness measurement. Only about 5 percent of an estimated 7,000 projects surveyed had completed a full adaptive management cycle (plan-do-check-adapt).

At the Conservancy, we have been working to improve upon these inauspicious statistics for quite some time. Nearly seven years ago, Sanjayan (then director of science for The Nature Conservancy in California) secured a major gift to help launch the Conservancy's efforts to evaluate the effectiveness of our strategies. Building upon that effort, Craig Groves and Brian McPeek worked with senior managers across the Conservancy to develop and implement the first measures business plan in January 2009.

The Conservancy has made significant progress in our measures work since the implementation of the plan:

- More than 300 staff members in over a dozen countries have been trained through an introduction to measuring strategy effectiveness.
- Two major Conservancy measures summits have highlighted and peer reviewed the measures aspects of 40 Conservancy projects.
- A Monitoring Fellows program has been launched to assist programs with limited technical capacity.
- A "measures program" is now included as one of the criteria for the board of directors' project review committee.
- And strategy effectiveness is now included as one of nine key questions that must be addressed in the preparation of business plans for those projects deemed organizational priorities by the Conservancy's chief conservation program officer.

[1] A partnership of conservation organizations (including the Conservancy) that seeks ways to design, manage and measure the impact of conservation actions. See www.conservationmeasures.org.

Despite this progress, evaluating our effectiveness remains spotty. There are still too few projects for which we can actually report on progress against measurable objectives or for which we have a good grasp of which strategies are working. In only a few have we begun to examine the social and economic impacts of our strategies. Moreover, we remain challenged to highlight Conservancy projects in which monitoring results have effectively fed back into the project management cycle and demonstrably improved those projects' strategies.

To address these challenges, we assembled a conservation measures team of senior managers in early 2010 and revised a measures business plan[2] that will guide the Conservancy's efforts during FY11 and FY12. Some of the most important concrete actions that you can expect to see in our measures work over the next two years are:

- Online training courses on strategy effectiveness measures and monitoring;
- Increased numbers of Coda Monitoring Fellows who are assisting priority projects;
- In-person training and peer review workshops;
- Inclusion of tracking results against measurable objectives in the chief conservation officer's management reviews for priority strategies and places; and
- Evaluating cross-cutting strategies such as the Sustainable Rivers Partnership across multiple sites where those strategies are being implemented.

That is where we have been and where we are headed. So how are we measuring up? My answer would be: good, steady, tangible progress.

We now have a clear management expectation that we will track progress of conservation results against measurable objectives in a set of organizational priority strategies and places. Strategy effectiveness measures have become part of the common vernacular of the Conservancy. And most senior managers now appreciate the importance of measuring our effectiveness, and many are finding measures training and tools to be quite useful for management.

The single most important ingredient to more widespread adoption of a measures or performance-based culture in the Conservancy is surprisingly simple. Senior managers and project directors must routinely ask the question: "What progress are we making against the measurable objectives we have set for ourselves in our strategies and actions that we are taking?"

If we routinely ask and answer that question — especially in an environment of peer review — we will be on a steady course to make strategy evaluation and adaptive management "business as usual" in our field programs and global teams, and to increase the return on investment of our conservation work. **SC**

[2] A copy of the Revised Measures Business Plan Summary and Executive Summary can be found on the Measures portion of the Conservation Gateway web site (www.conservationgateway.org).

Articles

Conservation and Poverty: Is an Ounce of Prevention Worth a Pound of Cure?

By Craig Leisher
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Grant me the indulgence of assuming that the Conservancy should be concerned about poverty. While not everyone on staff will agree, our field staff working in poor countries know that, unless our work there tangibly benefits local people, it will not be socially sustainable.

Here's a question that several colleagues have raised: When the Conservancy focuses on "poverty," should we focus on poverty reduction, poverty prevention...or both?

The analysis below suggests we should focus on poverty reduction wherever natural resources are heavily degraded…and poverty prevention wherever they are not. Why? Because poverty reduction and poverty prevention are a continuum that looks something like this:

Income-->----------I----------->

Poverty Reduction *Poverty Line* *Poverty Prevention*

Poverty is reduced until a person is above the poverty line; the emphasis then shifts to poverty prevention. *Reduction* generates new economic activity and wealth and moves the country forward. *Prevention* guards against drops in economic activity, provides insurance against losing existing wealth, and keeps a country from falling back economically.

For governments in developing countries — as well as for international development efforts — prioritizing poverty reduction over poverty prevention makes sense. Giving poor people the opportunities to move themselves out of poverty has greater medium- and long-term benefits for a country's economic development than does preventing people from falling back into poverty. The poor also need the help more than the non-poor. Poverty tends to be intergenerational, making it much harder to move someone out of poverty for the first time than move them out of poverty after a relapse.

For the Conservancy, it's not about deciding whether to focus on reduction or prevention, but about how the conservation opportunities in a particular site might benefit those in poverty. Whether a conservation project reduces or prevents poverty has much to do with the state of the natural resources at the project site. If the fisheries or the grasslands are degraded, restoring their productivity may help reduce local poverty. If a forest or a watershed is largely intact, there is little scope for poverty reduction, but much scope for poverty prevention. The more degraded the natural resource and the higher the dependence of local people on this resource, the greater the benefits are from restoration. Conservation challenges are often poverty reduction opportunities!

As we build our work in developing countries, we will find more support from governments and donors in those sites where poverty can be reduced than in sites where our work amounts to "saving the last great places."

But we also need to recognize that, as we build our work in developing countries, we will find more support from governments and donors in those sites where poverty can be reduced than in sites where our work amounts to "saving the last great places." It's the rare case for which the proverbial ounce of prevention is not worth a pound of cure. **SC**

Image: Waterfront view in the fishing village of Sanchez, Dominican Republic. Deforestation has washed sediments down rivers and choked parts of the bay. The shoreline has become an expanse of mud that local fishermen shove their boats through to reach fishable waters. Sewage from their outhouses runs straight into the mud here, where their livestock feed and where their children play barefoot. Yolany di Lani, age 6 (center), sits on a fence next to her brother in front of their home. Image credit: Carolyn Drake.

Peer Review: Jay Odell on Reef Resilience, MSP and Coral Reefs Drawn by Dr. Seuss

Name: Jay Odell

Title: Mid-Atlantic Program Director, The Nature Conservancy

Location: Richmond, Virginia USA

Tenure with the Conservancy: 7 years

Areas of Expertise: Marine science and policy; helping the marine conservation community to think through marine spatial planning (MSP) and support the development of science and data that will guide MSP.

You were a Coda Global Fellow this summer, working on reef resilience in Raja Ampat — but you didn't actually go to Raja Ampat. I'm confused.

ODELL: Here's the story: The IUCN recently developed — with a lot of Conservancy input — a coral reef survey protocol, designed to assess the resilience of coral reefs to global climate change effects. So our Indonesia marine program, working with partners, had collected two years of data during the first application of that survey protocol, at a large MPA in Raja Ampat.

They had data from about 50 different sites covering a wide range of variables — from the abundance and distribution of coral to coral recruitment to oceanographic factors to detailed information on the fish community. When I got an email saying would I consider this two-month Coda fellowship in Bali to work with this data, my first thought was, "Oh, my God, I've won the lottery." Of all the places in the world I could choose to go and help with our international work, this would be it.

But you're right — I didn't actually get to go to Raja Ampat. I was the whole time basically working on data on a computer at the Conservancy's office in Bali.

Still, it's Bali, right?

ODELL: I had never been to Southeast Asia before. It was as far away as I could go, exactly 12 hours time difference, on the other side of the world. I guess going to Bali is sort of like Southeast Asia on training wheels compared to some of the more remote places that don't see as much tourism. But I was really blown away by being in a completely different culture, and I

loved it. It was, as they say, the total immersion, and I was out exploring every weekend.

Did you find any of your cultural blind spots? Did you ever feel like the ugly American?

ODELL: I'm still kind of assimilating things. My view of the world is different now and will never be the same, but it's hard to articulate exactly why.

With a couple things that I thought I knew about already, direct experience of them really hit home. One, the extreme difference in material wealth between the average folks in the U.S. and in Bali. And two, the old saw that money doesn't make you happy. Based on the amount of time people spend laughing, the people in Bali are generally happier than people in the United States, even though they may only be living on a few dollars a day. The equivalent of a one-dollar tip is a super big deal to some folks who are helping you do things.

The other thing was that the TNC culture was quite different there. In the TNC Bali office, there was a cook on staff, and everyone got together and ate lunch (crazy spicy lunch) together every day when the bell rang, as opposed to sort of sitting at a desk or running out for a quick bite somewhere. There were also one or two brown bag sessions every week where people were sharing the results of their work. Even though our coral program there is incredibly busy — they do so much with so little — there was a family/team feel that was different from the TNC offices I've worked at in the States.

> On the state of reef resilience science: "Now that we have all these sites at Raja Ampat coded up, if there is a major bleaching event, it's going to provide pretty powerful evidence as to whether our hypotheses are correct or not."

That's Indonesia, though — people there are extremely polite. If you're calling someone on the phone or starting a conversation, you never would just jump in and get to the point — you always first ask how they're doing.

I was sort of expecting the ugly American thing, but when random people I talked to asked where I was from and I said "America," they tended to get big grins and say "California-California-California!" or "Obama-Obama-Obama!" There were lots of tourists, very few Americans.

Miss anything from home?

ODELL: Not really, I felt a little isolated at times. I decided not to invest in having an Internet connection where I was living, but there's lots of little Internet cafes in Bali. My plan when I first got there was just to be as Indonesian as I could be, and so I started off by eating nothing but Indonesian food, three meals a day, and after a few weeks, I realized it actually wasn't required by anybody that I only eat Indonesian food, and so I started enjoying other awesome food

at great restaurants run by chefs who escaped from other countries to live in Bali.

So you did this reef resilience analysis. What happens with it now?

ODELL: The analysis will feed into a technical report with the results of the survey and potentially a peer-reviewed paper or two, and it will help to inform a zoning plan for this MPA.

I was able to take a mountain of data and distill it into a matrix for multivariate analysis. Rows for all the different sites in the MPA and columns with variables relating to factors hypothesized to confer resilience. It was kind of exciting at the end — because there were very clear differences between sites for factors like coral recruitment, density of bleaching resistant species, etc.

About reef resilience — Peter Kareiva wrote in the last issue of* Chronicles *about a recent paper in* TREE *that says we don't know nearly as much as we claim to about reef resilience. What's your take?

ODELL: *TREE* is one of the many journals that TNC used to have access to, so I've only seen the abstract and Peter's review. But I think this Raja Ampat project really speaks to what Peter was talking about. It's a rigorous examination of a whole suite of many factors that are identified in the IUCN assessment protocol. Scale is going to turn out to be really important for some of the factors that we think influence reef resilience -- which factors are most worth measuring will depend on the scale of interest, and for some of the factors that may be the most important, we just don't have good data, like connectivity — how well different reef systems are connected through larval dispersal patterns.

There is something to what he's saying: If you read our four-page glossy pieces about how we are using resilience principles to inform our work and we're saving the world and all, the average reader is going to think we understand resilience much better than we really do.

But, at the same time, the Indonesia team has gone out and systematically collected all the data that will be needed to help answer those questions, to test those hypotheses about which factors confer resilience and which don't. Now that we have all these sites at Raja Ampat coded up, if there is a major bleaching event, it's going to provide pretty powerful evidence as to whether our hypotheses are correct or not.

You did some diving, right? The quote from you I heard second-hand was that you hadn't believed the hype about the Coral Triangle until you had actually dived into it.

ODELL: Not quite, but I'll try to tell you. I've done diving and snorkeling in many places around the world, but never in Indonesia or in the Coral Triangle. As soon as I went under water on an Indonesian coral reef, I did sort of go, "Oh, so I guess we can believe our PowerPoints about how great the Coral Triangle is."

And this is my Facebook status one day: I said it was as if Dr. Seuss took a look at the corals in the Caribbean and other places and then spent a thousand years riffing on them, saving all the best sketches and putting them in the Coral Triangle. Every few mo-

ments, I was like, "Oh my God, I've never seen anything like that before," over and over again. It was amazing. So many species, it was really amazing.

That experience of being able to go diving a few times really made me respect the skills required of our Indonesian dive survey teams. You know, I'm seeing these essentially blizzards of neon and rainbow colors of fish all around me, and the idea of swimming through these blizzards, methodically assessing and recording distribution and abundance of corals and fish — that requires mad skills.

On diving in the Coral Triangle: "Every few moments, I was like, 'Oh my God, I've never seen anything like that before,' over and over again."

So what are you taking back to Virginia with you, other than great dive memories?

ODELL: New friendships with our staff overseas, obviously. And the trip affirmed my faith that the Conservancy's niche and MO about area-based management approaches is sound. The way we achieve marine conservation in Indonesia is really by bringing good data to the table and working both with local communities, ocean resource stakeholders, and simultaneously working with government actors to influence policy. We're doing exactly the same thing in the U.S., and it's working in both places.

Also, the trip made me understand that, in taking climate change into account in our marine work in the U.S., we haven't gone much beyond thinking about coastal land protection to provide migration paths for salt marsh. I feel challenged and inspired to try to work with our partners on what climate change adaptation means in the marine environment. How should we be prioritizing our work differently, knowing that some pretty big seawater temperature mediated changes in the distribution and abundance of fish are on the horizon? I don't have an answer to that question, but I have a ramped up interest and some new skills to apply to it.

Given the makeup of the new Congress, is this a moment of truth for MSP work here in the United States?

ODELL: That's something that we talk about a lot. I think the moment actually comes towards the end of Obama's first term. We likely are not going to get the legislation that we really need to make the policy durable. If we get the same administration or a new simpatico one, in 2012, then we'll still be rocking and rolling, and if not, we'll have to reassess.

We've made great progress. While I was gone, our two-and-a-half-year project to create a marine ecoregional assessment for Cape Hatteras to Bay of Fund was finalized. At the same time, we got really strong new MSP policy out of Washington, D.C. We have a new North American Region marine priority to MSP, co-led by Jena Carter and me. We have talented marine policy and science staff in every coastal state — all together a perfect storm. We don't know how long it will last

and we're all very busy trying to exploit this window of opportunity while it lasts.

Will the public ever understand what's at stake with MSP? Most of them don't understand what the ocean means for their lives. How could we possibly sell them MSP?

ODELL: Well, our highest priority strategy is the wonkiest, unsexiest thing in the world to try to describe to a politician, taxi driver, donor or grandmother. So that is something that we are really struggling with. In broad strokes, we need to find ways to help people who don't feel directly connected to the ocean to understand that they are ocean stakeholders. And that MSP really isn't a big government plot to close their favorite ocean fishing hole.

That's consistent with the direction the whole Conservancy has been moving in. You know, the new fame of the Conservancy, saving nature for people and expanding the conservation base. Getting people fired up about and caring about the ocean is a challenge.

We need good stories to tell, we only have one really one — about how the shipping lanes in Boston Harbor were adjusted slightly to greatly reduce potential mortality of endangered right whales. We all use it over and over again. Around the country, we are right now working on multi-million dollar proposals to advance regional scale MSP, and I'm hopeful we'll be able to generate some good new stories soon. **SC**

Editor's Note: Learn more about Coda Global Fellowships.

Viewpoints

Making Sense of 'Biodiversity' Nonsense: A Call for a Return to Species

By Peter Kareiva, Chief Scientist, The Nature Conservancy
and *James Fitzsimons, Director of Conservation, The Nature Conservancy in Australia*
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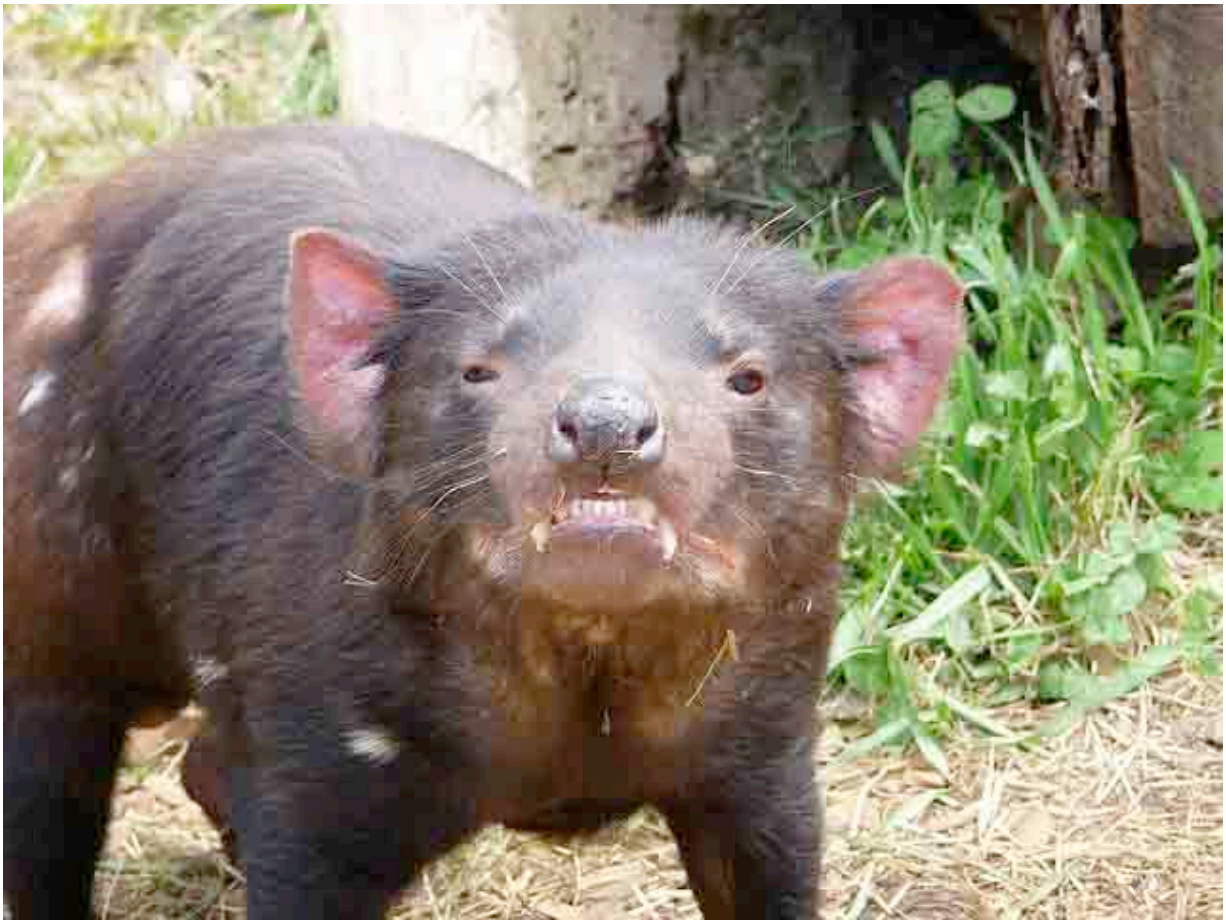

Effective environmental policy requires measurable goals. So how does the one and only global biodiversity treaty shape up when it comes to being measurable?

Reporting on the recent Nagoya Convention on Biodiversity, Neil MacFarquhar of *The New York Times* wrote: "...the Nagoya Protocol...sets a goal of cutting the current extinction rate by half or more by 2020." In the next sentence, MacFarquhar gave some indication of how well we know the current extinction rate: "The earth is losing species at 100 to 1,000 times the historical average."

Hmmm. Given the uncertainty of the second sentence, does any reader think it's scientifically possible to determine whether or not we have reduced the extinction rate by 2020, much less know if we have cut it by half? Where do these international bodies come up with this stuff?

For sure, Nagoya did produce some measurable objectives (see *Science* 330:742-743) — but only one of those measurable targets referred to species (i.e., "prevent the extinction of known threatened species"). So should we be satisfied if, in the next nine years, we have not documented the extinction of any known threatened species? And is this the sort of quantitative target that will help countries know how well they are doing regarding conservation? We think not.

Species matter — they are concrete, identifiable and iconic; they stir emotions and action to a degree far beyond what other components of biodiversity ever could.

The problem lies with "biodiversity" and "biodiversity loss" — their abstractness, the remoteness of these concepts. By contrast, the political and public will to enact the U.S. Endangered Species Act in the early 1970s was due in large part to the American public caring about *specific species* (Kareiva and Marvier, 2010). Species matter — they are concrete, identifiable and iconic; they stir emotions and action to a degree far beyond what other components of biodiversity (i.e., ecosystems and genetics) ever could.

For instance, the front pages of U.S. newspapers reported weekly on the size of the dwindling whooping crane population, which fell to as few as 21 in 1941. The dire straits of the whooping crane led to real conservation progress to benefit the species: At least 266 whooping cranes are known to have made the annual migration to Texas in 2007.

And "biodiversity" doesn't just leave the public cold. Goals such as "reducing extinction loss by half" are for the birds, not for scientists or for managers who really want to know their effectiveness. We propose instead that nations adopt much more measurable and concrete goals by producing *a manageable national list of species* whose actual numbers their environmental ministries and conservation organizations would track and publicly report on through time. Each nation (or province or state) could judge itself by the population trends and number of populations (or extent or quality of habitat) for its indicator and iconic species.

In Australia, for instance, the following list of species (and habitats) would make for a pretty good conservation report card:

- **Tasmanian Devil** (threatened by facial tumor disease);
- **Greater Bilby** (threatened by predation from introduced predators and habitat degradation);
- **Emu** (for northern Australia; threatened by changed fire regimes);
- **Southern Cassowary** (threatened by habitat loss/fragmentation/degradation, traffic, dog attacks);
- **Great White Shark** (threatened by overfishing);

- **Spot-tailed Quoll** (threatened by habitat loss and fragmentation, accidental poisoning);
- **Murray Cod** (iconic freshwater fish of southeast Australian waterways; threatened by overfishing, river regulation and habitat degradation);
- **Mountain Pygmy Possum** (alpine specialist, threatened by climate change, habitat loss/modification from ski-run development and introduced predators);
- A variety of **wattle** (*Acacia*) species in semi-arid South Australia, NSW and Queensland (threatened by overgrazing); and
- **Monsoon rainforests** (northern Australia in pockets between savanna; good indicator of healthy fire regimes).

The above is just a first draft of Australia's list, and scientists would likely argue and debate for years which species and habitats to include and exclude. But even an imperfect list would be a lot better than simply requiring that protected areas be established, or management plans be drawn up. The bottom line is that there are species people care about — and that by paying more attention to those iconic species and habitats that are countable, we will leave the bureaucrats less wiggle room than a goal like "cutting the extinction rate by half."

Without such lists, Australia could lose the Tasmanian devil while still being able to boast about the land it has placed under conservation status — all as we wonder why the public becomes more and more alienated from conservation. **SC**

Image: Tasmanian devil. Image credit: WOAW-the world of animal welfare/Flickr through a Creative Commons license.

Viewpoints

How the Conservancy Can (Finally) Enter the Digital Age

By Jonathan Adams, Program Manager, The Nature Conservancy
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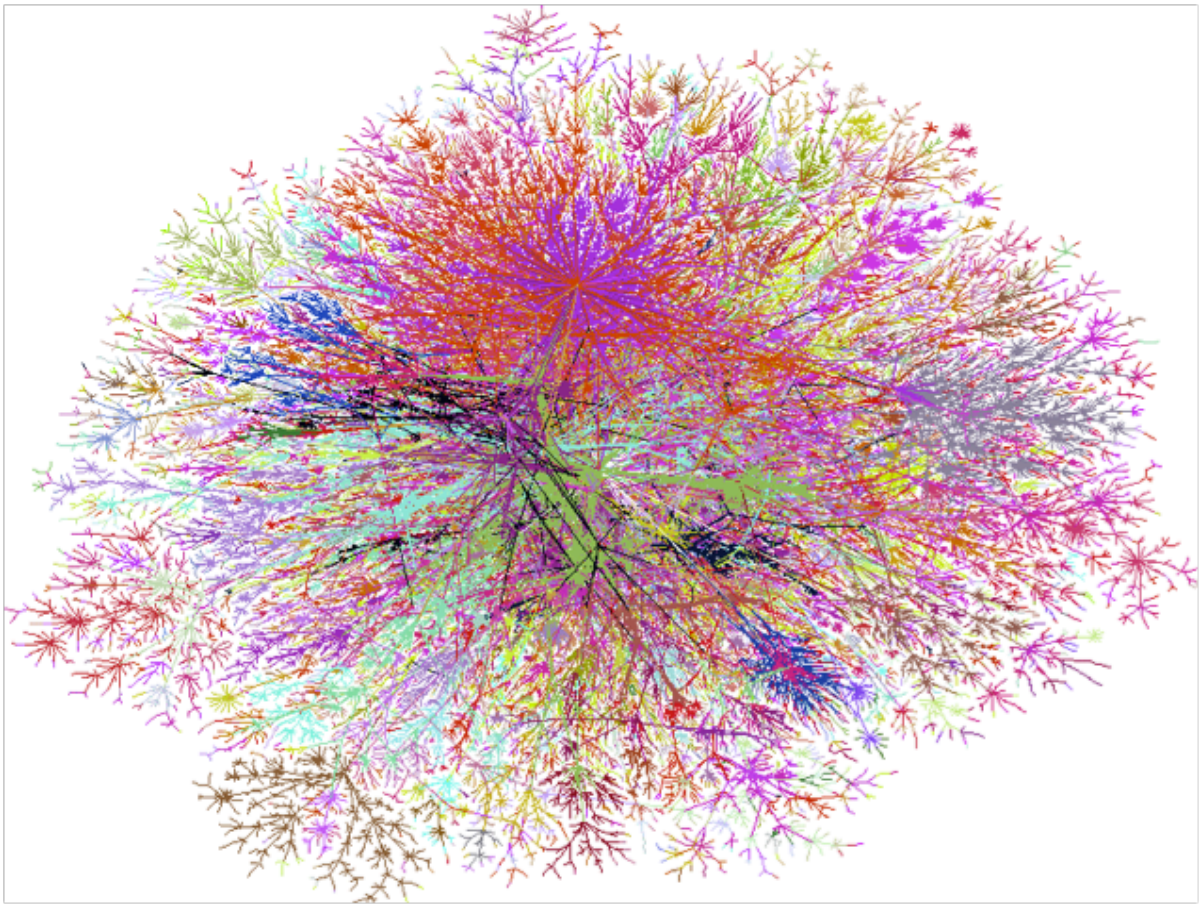

Above is the Internet, circa 1998, courtesy of Bell Labs and *Wired* magazine. Each of the 100,000 or so nodes depicted is an internet service provider.

I have always been fascinated by this map, because it seems to be a technological corollary to Barry Commoner's First Law of Ecology: Everything is connected to everything else. But there is a crucial distinction for conservationists: In ecology, the connections exist regardless (or often in spite of) the choices we humans make. For information technology, the connections exist only if we choose to participate.

For the most part, conservationists have participated in the information explosion of the last 20 years largely as passive consumers of knowledge, not as creators of knowledge that

others can use. The power of connectedness lies in realizing that we are all now publishers as well as consumers. The transformative potential of that power may be our greatest untapped resource.

The goal for The Nature Conservancy and for the conservation community as a whole isn't just to be better stewards of the Earth — it's to be better stewards of the knowledge and expertise we create to help others be better stewards of the Earth.

Why is it untapped? Conservation is an action-oriented discipline. Conservation practitioners are using and gaining experience about their strategies and actions every day. Yet much of what they learn is either never written down, or is not shared beyond the project team or (at best) their organization. The goal for The Nature Conservancy, its partners and indeed for the conservation community as a whole isn't just to be better stewards of the Earth — it's to be better stewards of the knowledge and expertise we create as individuals and organizations to help others be better stewards of the Earth.

In September's *Chronicles*, I argued that every scientist at the Conservancy must actively both disseminate and market knowledge that is credible, relevant and well-used (which is not the equivalent of just reporting our successes), thereby developing and delivering knowledge that conservation practitioners can use to solve problems and improve their practice.

My call to share our knowledge isn't an argument that conservation has failed to grasp the power of the new ways of sharing data. The Conservancy has launched many experiments in knowledge sharing at various scales and with varying degrees of success — ConPro, TNC's Expertise Application, ConserveOnline and the many independent workspaces within it, to name a few. Some of these efforts have been highly successful and rich; others not. But the Conservancy has been less willing to experiment with new technologies in electronic publishing, which hold great potential as a means for sharing our experience and linking with other sources of information.

Why is electronic publishing so important? It meets the needs of practitioners: They want to know where information is and who has which expertise, and they also need streamlined ways to get feedback on their own work and appropriate tools to publish it. Electronic publishing allows searches that produce fast, relevant results, with rich metadata and both current and archival material.

Improving the integration of conservation information will be complex endeavor, involving cultural, legal, institutional and technical challenges. And with such a diversity of tools and sources, the landscape of conservation knowledge is highly fragmented. Still, it's up to us to start knitting together the landscape of tools. Here is a set of clear steps that each of us can take now that will provide the foundation for what will inevitably be a lengthy process:

- Put your data in ConPro;
- Keep your TEA profile up to date;
- Submit your work for internal peer review, and volunteer to be a reviewer;
- Publish! In the usual suspects (*Conservation Biology, Ecology*, etc.) or *Public Library of Science* (PLoS), conservationevidence.com, or one of the many other online journals.
- Use the ConserveOnline library, even for articles published elsewhere (see here for more). Under self-archiving rules, we can make nearly every article ever written by Conservancy staff available for free to anyone in the world. This simple step will put some real substance behind our claim to be promoting open-access to conservation information.
- Contribute to systematic reviews of conservation practice through Collaboration for Environmental Evidence.

These steps rest on two fundamental principles. First, conservation information must be freely available to anyone who needs it unless there are compelling legal or ethical reasons (e.g., unresolved issues of ownership or contractual obligations, or precise location information of an endangered population) to keep it private.

Second, effective knowledge sharing efforts solve problems or address needs faced by practitioners. Simply providing information is no guarantee that people will actually use it to improve their practice. We need to understand what conservation practitioners need and develop and deliver knowledge that they can use to solve problems.

An organization as complex and with as long a history as the Conservancy will not transform itself into a learning organization overnight. Making better use of the tools we already have at hand will be an important step. But we will also need constant prodding and support from our senior leadership, reminding us that we are an integral part of a broad community that needs us to be a model for conservation in the digital age. **SC**

Viewpoints

Fear and Conformity in Conservation

By Erik Meijaard, People and Nature Consulting International
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Conservation is like guerrilla warfare. But are the similarities flattering for conservationists?

No matter how big, conventional and entwined with power conservation organizations get, they still have the posture of guerilla groups. While conventional warfare seeks to reduce an opponent's capability through head-on confrontation, guerrillas seek to undermine the opponents' strength and their public support. Guerrillas often also have popular backing and are financed through outside supporters.

Conservation works similarly through strategically picked battles (our conservation projects). Public and outside support is crucial to conservation's success. And our "armies" are so much smaller than those employed by "the enemy."

You might be encouraged by these comparisons. But conservation and guerrilla organizations have other, less comforting similarities: the way they communicate, their near-religious underpinnings, and their penchant for groupthink.

Guerrilla fighters are dispersed and their organizations need strong internal communication to ensure that everyone is in line. External communication through propaganda is vital to ensure public support. Strict loyalty to the group is also crucial. You are either in or out, although "out" is not really an option once you are "in."

Judging by the hundreds of daily emails, frequent meetings and many papers to sign and forms to fill in that plague our business, conservation workers encounter similar views of communication and a devotion to (if not obsession with) process. Process and groupthink bring coherence to an organization, but they also control its individuals. Holding alternative views and speaking your mind about the direction of conservation, or criticizing management, are generally frowned upon within a conservation organization as harmful to its unity.

This is where I see conservation now — as a collection of aging guerillas, holding on to an old vision, old ways of organizing and communicating, and an aging constituency as we slide toward irrelevance.

This impulse to police makes sense: Conservation and guerrillas are strongly mission-driven. And even if the practical implications of that mission are often unclear, the organizational principles that follow it have quasi-religious powers. Stepping outside that framework and being openly critical are often seen as heretical. Also, those who control and administer the process — the priests or apparatchiks, if you will — become focused on and defenders of process to the exclusion of substantive goals, because that is how they defend their position of power and authority.

As with conservation, the success rate for guerrilla war is mixed. Some guerillas fail in their mission and either fade away or join regular, established governments. Those that succeed often stay in power for decades, rarely if ever through democratic means. Somewhere along the line, they pass a tipping point in growth, stop being flexible and creative, and become sclerotic.

This is where I see conservation now — as a collection of aging guerillas, holding on to an old vision, old ways of organizing and communicating, and an aging constituency as we slide toward irrelevance. We've forgotten the guerilla's ability to improvise under difficult conditions and to strategically pick the battles that will lead to the biggest net gain. Do we still have that entrepreneurial spirit in conservation? Does conservation generate enough creativity and reward it appropriately? And can individuals still have a major impact on what we do, or has the agenda been hijacked by conservation organizations that have become too big and cumbersome to function effectively?

Where I hope conservation can differentiate itself from guerilla fighting is in the nature of our wars, and what we consider success or failure. Our wars are not black and white; this is not about winning the mother of all conservation battles, after which we can rest on our laurels or sleep in our graves. Our battle is never over. Conservation is not about right and wrong, either. There are no religious conservation principles to adhere to; there is only muddling through.

Conservation will forever be a struggle to defend the wildlife and environments of this planet against human greed and indifference. Once we realize that the struggle is

truly endless — that we will never "win" the war — we can step away out of our internal straitjacket and become the smart, nimble, flexible, adaptable, compromise-seeking and solutions-focused movement that we need to be. Unfortunately, I rarely encounter these characteristics in conservation organizations, which tend to be conformist, bureaucratic, internally-focused, opaque, unaccountable and often in competition with other conservation organizations.

All this leaves me a bit uneasy. I seem to be preaching some neoliberal agenda wherein conservation will be driven by individuals and small groups in some meritocratic framework. While I think this is what conservation needs, there is definitely some personal irony here. Because while promoting that agenda, I realize at the same time that conservation success requires broad-level societal support and a social agenda — a realization that puts me back on the left side of politics. No wonder I feel a bit torn these days.

Maybe I confuse the practical needs of now with ideal solutions for the long term. In the short term, conservation should become an accepted societal goal, with practical solutions to everyday problems. Ideally, it should become a way of life, with individual people building their ethical systems on a basis of respect for nature. The key to either model is the dedication of individuals to set examples about how things can be done better. When choosing between the three spirited fighters depicted above this piece, we might want to be a bit less like Che, stop acting like Don Quixote, and walk and talk more like Nelson Mandela. **SC**

New Conservancy Research

The Ecological Impact of Biofuels

Fargione J.E., R.J. Plevin, J.D. Hill. 2010. The ecological impact of biofuels. Annual Review of Ecology, Evolution, and Systematics 41:351–77

Sometimes *Science Chronicles* contains reviews of recent scientific articles from a clear-eyed and critical scientific perspective. Full disclosure: This is no such review, since I wrote both the scientific article *and* this review of it. So you won't be surprised to hear that I think this paper is an excellent overview of the ecological impact of biofuels.

More surprising, however, may be some of the paper's findings. We attempted to provide quantitative answers to many of the most commonly asked questions about biofuels — including questions on land use, GHG impacts from land use and fossil fuel use, water use and biodiversity impacts.

First, some context: In 2008, biofuel production required about 33.3 million ha, or about 2.2 percent of global cropland, in order to produce about 1.7 percent of global liquid fuel production (on an energy basis). The World Energy Outlook predicts that biofuel production will increase over 2008 levels by at least 170 percent by 2020, and that this increase will come almost exclusively from first-generation biofuels (i.e., the five food crops: corn, sugarcane, soy, oil palm, and rapeseed). Current U.S. law mandates the blending of 36 billion gallons of ethanol by 2022, which would increase global ethanol production by 150 percent over 2008 levels, even if ethanol production in the rest of the world did not increase. (So-called second-generation biofuels include cellulosic ethanol made from biomass, but the estimated date that cellulosic ethanol will be commercially available keeps retreating into the future.)

Turning food into fuel on such a large scale raises several issues for conservation, even leaving aside ethical issues associated with the potential for biofuels to compete with food production:

Increasing stress on water supplies: Irrigated corn requires about 643 gallons of water for every gallon of ethanol. Because rain-fed cropland in the United States is already largely in use, new corn production is occurring disproportionately on irrigated lands — 34 percent of the new corn production between 2003 and 2008 came from irrigated lands. This is not good news for the Ogallala aquifer.

Increasing land conversion to agriculture: The amount of land required for biofuel production is a function of conversion efficiencies, crop yields, unharvested areas and co-products. The paper reviews current and likely future values for all of these variables for current and proposed biomass crops. One notable result is that, although crop yields are increasing throughout the globe, the increases are consistently linear. These empirical trends suggest that yield increases will not be a panacea — increased biofuel production *will* mean converting more land to agriculture.

One piece of good news is that, for some crops, biofuel production generates co-products that can offset a substantial chunk of their land use. Specifically, corn produces distillers grains and solubles (DGS), which are fed to livestock, replacing some of the corn and soybean meal in livestock diets. Because soy has lower yields and therefore requires more land to grow than does corn, when DGS replaces soybean meal, that replacement makes for a lot of cropland that you don't need for growing soy. In total, DGS may offset about 60 percent of the land needed to grow corn for ethanol, so that the net increase in agricultural land required to meet our food and fuel demand is only about 40 percent of the land used for corn ethanol.

The carbon debt of corn ethanol: There have now been a handful of studies that estimate the net GHG impact of first-generation biofuels, taking their land demand into account. For example, the EPA estimates that, for every hectare of corn used for ethanol, there are about 0.43 hectares put into new cropland (the figure is lower than 1 because of DGS co-products and because ethanol demand raises corn prices, which suppresses demand for corn). Global average emissions from new cropland are about 200 Mg CO2 per hectare. This means that every hectare of new corn ethanol is responsible for about 83 Mg of CO2 emissions due to land-use change somewhere in the world. In 2008, we coined the term "carbon debt" to describe these one-time emissions associated with land-use change (Fargione et al. 2008). If the corn ethanol produced on that hectare eliminated an equivalent amount of gasoline consumption, it would take about 70 years of corn production to reduce CO2 emissions to repay this carbon debt. In the meantime, the net effect of corn ethanol production is to *increase* atmospheric CO2 concentrations.

Effects on biodiversity: The direct impacts to biofuels on biodiversity are, in general, not very well studied — but there are several notable exceptions. Fletcher et al. (2010) report that animal diversity in row crops such as corn and soy (as measured with, e.g., species richness or Shannon's Index) was reduced by about 60 percent compared to reference habitat. Studies in oil palm plantations find that 85 percent of animal species found in paired primary forests were

absent in oil palm plantations (Fitzherbert et al. 2008). We expect that sugarcane plantations are similarly depauperate compared to native cerrado and coastal Brazilian rainforests, both of which could be impacted by increased sugarcane and soy production to meet biofuel demands.

Solutions: The Nature Conservancy has pioneered Development by Design approaches that could be fruitfully applied to biofuel production — especially in Brazil, Indonesia and Malaysia, where biofuels are contributing to habitat loss on the agricultural frontier. To apply this approach to biofuels, areas that need to be avoided should be defined and areas already converted or degraded should be identified and targeted for new biofuel production. Companies should be encouraged to pay compensatory mitigation to offset residual impacts. For example, companies that purchase food crops from existing cropland for biofuel production could calculate the likely indirect land-use change impact associated with displacing food production and pay for an equivalent amount of habitat restoration or for habitat protection that saves an equivalent amount of habitat from conversion.

Future advances in technology may (or may not) bring super-algae that produces fuel from a significantly smaller land footprint and could see society get much better at using biomass wastes to produce fuel. But such solutions, if they are forthcoming, are a ways off. The reality is that globally we are producing biofuels almost exclusively through food crops, and we will continue to do so for the next decade, if not longer. This fact makes biofuels into a globally significant contributor to habitat conversion and a good candidate for conservation strategies that the Conservancy has successfully applied to other forms of development. **SC**

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Science Shorts

Are Cities (and Babies) Bad for Climate Change?

O'Neill, B.C. et al. 2010. Global demographic trends and future carbon emissions. Proceedings of the National Academies of Science 107(41):17521-17526.

One recent paper in PNAS has gotten a lot of press attention — and no wonder. Here are some headlines: "Slowing population: Would it curb climate change?" (*Los Angeles Times*) and "Will birth control solve climate change?" (*Scientific American*). Sigh. It's amazing sometimes to watch the leap the press makes from a scientific study to a presumed policy action.

The paper, by Brian O'Neill and colleagues, incorporates a basic demographic model of population age, household size and urbanization into an economic model of emissions. As a work of science, it's a solid analysis. They show that aging populations have been associated with fewer greenhouse gas emissions, primarily because older people work less and hence generate less economic output, which is highly correlated with emissions. Similarly, more urban populations have greater emissions, primarily because urban households are more productive and hence generate more economic output…which increases emissions. The most useful contribution of the paper is to show that existing scenarios of future emissions may be overestimations, because they have not properly accounted for the effects of demography (and, particularly, aging). Certainly, they've made the case that future scenario building by the IPCC needs to incorporate explicit demographic forecasts.

However, while the paper focuses on just how much various variables correlate with the amount of greenhouse gas emissions, it (*contra* the press coverage) says very little about the "cause" of those emissions. In reality, the process of economic development in countries almost invariably is associated with increases in GDP, productivity, average age and urbanization, as well as with a decrease in birth rates and household size. Since these processes all occur contemporaneously, it's very hard to say one of them "causes" increased greenhouse gas emissions. The evidence from demographers and economists generally suggests that, if anything, it is economic growth that causes the other demographic processes. Which is why it is really odd that O'Neill's model explicitly does not incorporate any effect of economics on demographics. Basically, O'Neill's model only allows demography to affect economics (and hence emissions), and then trumpets as a finding that changes in demography will change emissions!

The press was quick to jump to some policy solutions based upon the paper's findings (We should all move to the countryside! And bring birth control!), even though O'Neill et al. explicitly warn that "our results do not imply that policies influencing aging or urbanization would be the most appropriate response." Essentially, saying something is a strong correlate of global emissions does not mean it is a target policymakers can easily influence. Certainly, most

policies that have attempted to limit urbanization have been failures, generally generating large numbers of undocumented urban residents. And I have no idea how policymakers would even try to influence the global population's aging!

There is some scope for population control to limit emissions. Perhaps the most policy relevant analysis of the effect of population growth on emissions is buried on page 5 of the "Supporting Information" section; it shows that, in a sample of less developed countries, the average couple has 0.64 children more than their stated ideal family size. Thus, an investment in providing access to birth control would presumably reduce population growth in these countries by a significant amount (around 20 percent), and hence also reduce emissions. **SC**

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Son of Dust Bowl?

Jung M. et al. 2010. Recent decline in the global land evapotranspiration trend due to limited moisture supply. Nature 467:951-54.

Jung et al. find that higher temperatures are intensifying the hydrologic cycle and causing higher rates of evapotranspiration — rates that may already be up against soil moisture limitations.

Based on observations from FLUXNET stations throughout the world, this study found that rates of actual evapotranspiration — the water that is evaporated from the earth's surface or plants take up from the soil — increased over the first half of the past quarter-century (1982-1997), as would be expected with warming temperatures. But the authors discovered a disconcerting detail: evapotranspiration rates have *decreased* recently (1998-2008) and are correlated with observed decreases in soil moisture over many parts of the world. The largest declines in evapotranspiration occurred most strongly in the moisture-limited areas of the Southern Hemisphere, where lower evapotranspiration is expected to cause atmospheric feedbacks that lower humidity and increase dryness.

After ruling out many other potential causes, the authors conclude that the strong spatial coincidence of independently estimated decreasing evapotranspiration and soil moisture trends suggest that decreasing moisture supply in the Southern Hemisphere is the main mechanism responsible for these observations.

Whether this phenomenon is a natural cycle or part of a "more permanent reorganization of the global land water cycle," as the authors put it, remains a key question. If such moisture limitation turns out to be permanent, the long-term consequences could be decreased ter-

restrial productivity, reduced carbon sequestration, and accelerated land-surface warming through land-atmosphere feedbacks.

We know soil moisture limitation is one of the major ways climate change can impact both nature and people; this study provides direct observations that it may already be underway globally. **SC**

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News, Announcements and Orgspeak

Earth Day and Marketing Our Work: Two Calls for Compelling Research and Factoids

Earth Day *depends on you*! And the future of the Conservancy *depends on you*!

OK, a tad overstated (in the first case). But I've received **two urgent requests** from our colleagues in the Conservancy's Marketing and Membership division that warrant your attention:

1) **Food and conservation science**. This year's Conservancy Earth Day campaign centers on food and conservation —- how the food we eat impacts nature, and how conservation helps lessen that impact and enhances food security. Marketing is looking for *the most compelling examples of relationships between food and conservation*...so what are they, Science? Salmon? Oyster reefs? Best management practices for nutrient runoff? Our work with ranchers? Your best suggestions will translate into a lot of attention by external audiences, so send them to me at rlalasz@tnc.org.

2) **Compelling factoids about our work**. The more concrete your images and stories, the more compelling your communication. Which is where the Conservancy falls down flat: From marine spatial planning to environmental flows to REDD, we are straitjacketed by our own addiction to concept and abstraction. Begona Vasquez-Santos, director of membership at the Conservancy's membership operations, is *asking Conservancy science to provide concrete and tangible ways of making our work relevant to potential members*. To wit:

    - "With a $10 donation The Nature Conservancy can create enough habitat for 300 oysters!"
    - "Oysters are critical to the marshlands of the Gulf Coast and help create habitats for fish, shrimp, and crabs. All of these animals will need clean, healthy habitats long after the oil spill is stopped."
    - "In one day a healthy oyster can clean and filter 30 gallons of water! That is another reason why these creatures are critical to helping restore the Gulf."

So *what are your concrete factoids*? We need this ASAP — just send them to me and I'll get them to Begona. Many thanks in advance for your help.

—**Bob Lalasz**, director of science communications, The Nature Conservancy
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Conservancy Publications

Please send new citations and the PDF (when possible) to: pkareiva@tnc.org *and* rlalasz@tnc.org

NOTE: New additions since last month in red; Conservancy-affiliated authors highlighted in ***bold****.*

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